The Status of MiniBooNE

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This paper provides a brief status report for Fermilab E-898, the mini-Booster Neutrino Experiment (miniBooNE). Presently concentrating on construction activities associated with the beam and detector, the collaboration is looking forward to the day when data taking and analysis will more fully occupy its time. First beam is expected in the Spring of 2002, and initial results are anticipated in 2003.

1. Introduction

MiniBooNE[1] was approved as an experiment to investigate the validity of the LSND[2] effect, but it is also the only neutrino oscillation experiment that studies the parameter space that is of cosmological interest. Fig. 1 shows schematically the region of parameter space covered by various neutrino experiments - solar, atmospheric and accelerator based. MiniBooNE will investigate the region that may shed light on issues in hot dark matter, and galaxy formation models.

Since its approval by the Fermilab Director in May 1999, progress has been made in construction of the detector enclosure and the detector; construction of a new 8 GeV beam transport enclosure; a horn focusing system; and a neutrino beam including target station and decay region. The schematic diagram of these elements is shown in Fig. 2. The Booster accelerator; the 8 GeV Beam-line; the horn; target; decay pipe; and detector are shown. The position of the detector, relative to the target, was chosen as an optimal location for the initial, single detector, run of miniBooNE.

There are furthermore, issues in HEP that will be addressed by miniBooNE and other accelerator based experiments. In particular, as seen in Fig. 3, there exist at least two schemes to explain the three effects, seen in Fig. 1, in light of the recent SNO results[3]. The time-scale for obtaining results from miniBooNE and other experiments,

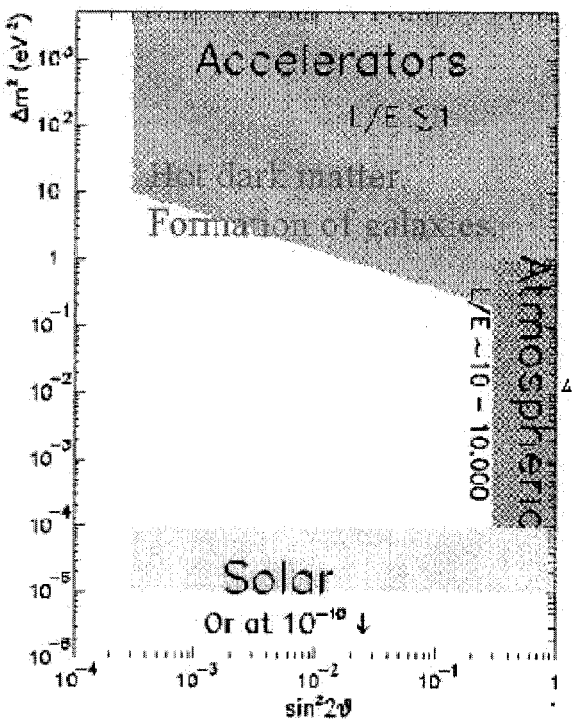

Figure 1. A typical coverage of Parameter space by Solar, Atmospheric, and Accelerator experiments.

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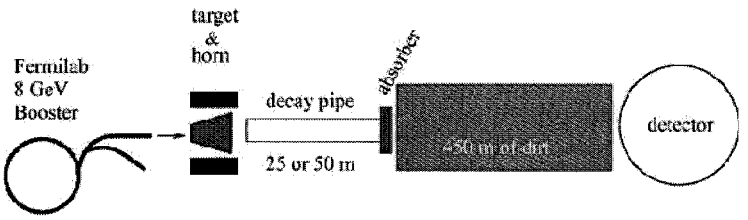

Figure 2. A schematic diagram of the beamline and detector.

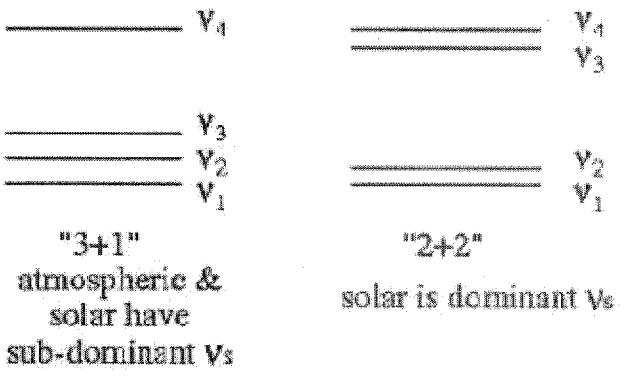

Figure 3. Two models that include a sterile neutrino that might explain current data.

to answer these questions is given in Fig. 4. MiniBooNE is adhering closely to the schedule shown in Fig. 4.

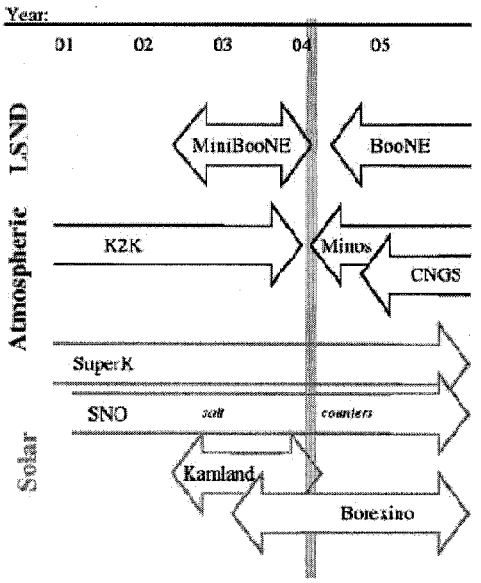

Figure 4. Overall schedules of experiments dealing with neutrino oscillation experiments.

2. How Are We doing?

Since its inception in 1999, a great deal has happened to bring the experiment to reality. A new beam transport system will be built to bring the 8 GeV beam from the Booster accelerator to the target area. The civil construction for the beamline is virtually complete. A view of the beam tunnel is given in Fig. 5.

The neutrino beam focusing horn and its power supply have been built and are undergoing tests. A total of ten to twenty million pulses will be accumulated before the horn is placed in the beam. A photo of the horn is shown in Fig. 6.

At this time also we have nearly completed the civil construction. Work is progressing on the last major element which is a target service building. The steel framework and decking are complete, and siding will be applied within a few weeks.

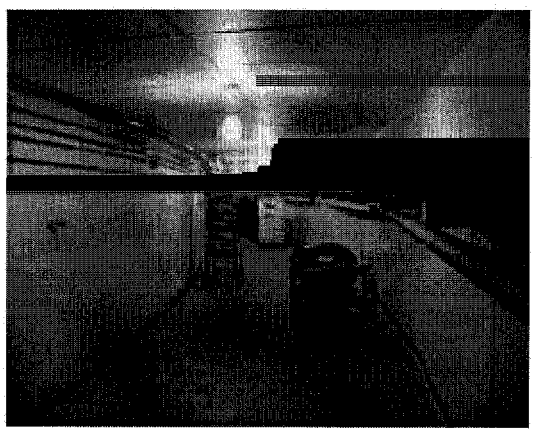

Figure 5. A photo of the 8 GeV beam transport tunnel.

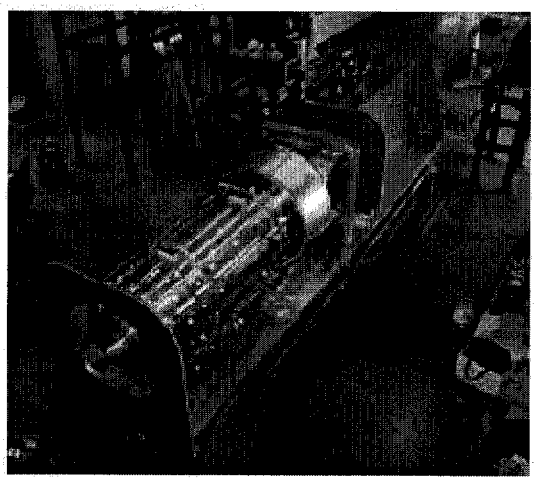

Figure 6. The focusing horn being prepared for extensive tests.

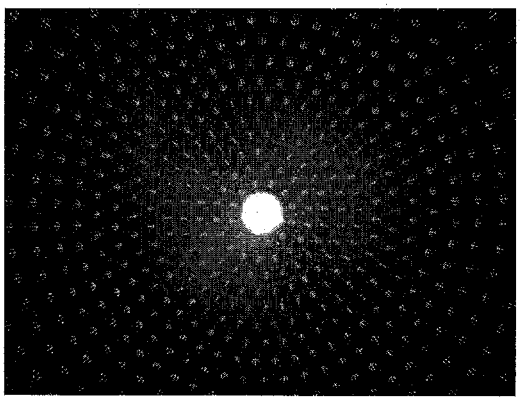

Figure 7. A photo from inside of the detector sowing some of the 1500 PMTs.

Work also remains to be done in the decay pipe region. Civil construction should be complete by the end of December.

The detector itself is about to begin tank empty runs to test the 1500 PMTs. A photo of the inside of the tank is shown in Fig. 7. By the end of the year the tank should be filled with mineral oil, and cosmic ray tests will begin.

3. Conclusion

MiniBooNE offers a means of resolving some critical issues in neutrino physics. The construction of the beam and detector is on schedule for operations in mid-2002. Early results are expected in 2003.

REFERENCES

1. A Proposal to Measure $\nu_\mu \rightarrow \nu_e$ Oscillations and ν_μ Disappearance at the Fermilab Booster: BooNE; E. Church *et al.*' Fermilab Proposal 898, December 7, 1997.
2. C. Athnassopoulos *et al.*, Phys. Rev. Lett. **75**, 2650 (1995); C. Athnassopoulos *et al.*, Phys. Rev. Lett. **77**, 3082 (1996); C. Athnassopoulos *et al.*, Phys. Rev. C. **54**, 3082 (1996).
3. For example, see talk by Eligio Lisi given at this workshop.